

SCIENCE

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BRILLIANT AURORÆ OF 1892.

BY LEWIS SWIFT, ROCHESTER, N. Y.

THE months of June and July of the current year will long be remembered as having afforded three interesting auroral displays, one of them being of unrivalled splendor and intensity. Of all the newspaper descriptions of them which I have read, not one

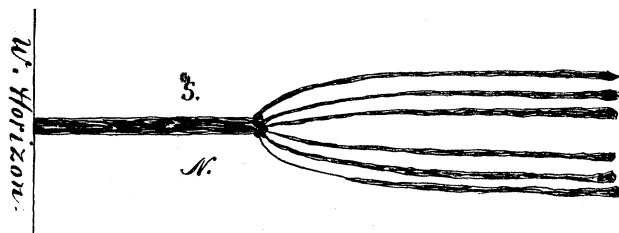


FIG. 1.

portrays them as seen from the flat roof of the Warner Observatory with an unobstructed horizon. Two of these exhibitions I consider unique if not unexampled.

On the evening of June 16, just before midnight, turning my eye from the telescope, a bright narrow beam of light was seen extending from the western horizon to an elevation of some 50°, at right angles to the magnetic meridian, and, of course, parallel with its equator. Here it divided into six parallel bands or branches, like six gigantic fingers of an outstretched hand, which continued to 5° beyond Alpha Cygni, or to a length of more than 60°, when they all sharply ended (Fig. 1). After a visibility of about twenty minutes it slowly disappeared, and was the only sign of aurora observed during that entire night.

Again, at early twilight on the evening of July 16, a portion of a faint auroral band some 15° in length was observed just south of Alpha Aquilla, having on the south side two, and on the north,

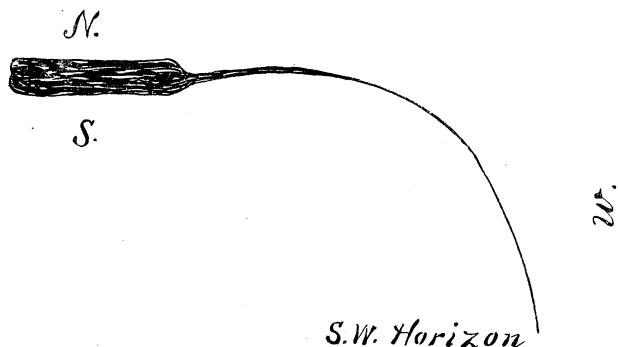


FIG. 2.

one short, narrow band close to, though not touching, the principal one. This, being so far south, was of itself an uncommon occurrence, and, as twilight deepened into night, a slender stem not exceeding 15° in width issued from the western end and gradually lengthened, curving to the south-west and south until, like a mighty sickle, the band serving for a handle and the curved ray for its cutting blade, it reached nearly to the south-western horizon (Fig. 2). It lasted about a half-hour, growing brighter and longer as twilight increased, when it quite suddenly disappeared. Immediately after, a rosy cloud and tinted streamers

appeared in the north west, and the grandest auroral display of the century commenced.

During thirty five years of out-door night work I have never seen any auroral phenomena at all resembling these two instances, and would much like to know if these appearances were witnessed by other observers elsewhere.

A perfect auroral exhibition consists of at least ten distinct phenomena. It is very seldom, however, that all or even a majority of the requisites are present at any one display. They are here named in the order of their most usual appearance: 1, evenly diffused light in the north; 2, a dark arch whose apex is in the magnetic meridian; 3, streamers; 4, luminous patches, especially in the north-west, sometimes of a red color, often for a long time stationary; 5, colored patches and streamers; 6, merry dancers; 7, corona in the magnetic meridian and equator, the point where the streamers seem by perspective to converge; 8, streamers issuing south from the corona, occasionally extending to near the southern horizon; 9, curtains, with frilled, wavy edges, apparently suspended from the sky; 10, narrow luminous bands, often reaching from the eastern to the western horizon, always at a right angle to the magnetic meridian, but seldom, if ever, coincident with its equator.

As seen from this station by myself, my assistant, and a friend, all of the above features, save the hanging curtains, were simultaneously visible.

That there is a connection between the aurora and sun-spots is quite generally conceded, though denied by some eminent authorities. We know that auroræ frequently occur when no spots are visible on the sun, and that sun-spots are often seen when auroral exhibitions, either boreal or austral, are entirely absent, but to this the advocates of the theory make answer to the former that sun-spots may have been on the other side of the sun, and, to the latter objection, that there may have been auroræ visible only in the Arctic or the Antarctic regions, or in both. But there is need of further confirmatory evidence by the general co-operation of astronomers in the collection of enlarged data for the establishment, modification, or complete rejection of the prevailing theory that sun-spots, auroræ, and terrestrial magnetism are intimately connected.

Intelligence has just reached me that the famous display of July 16 was also witnessed from the southern hemisphere on a scale of grandeur comparable to our own. This simultaneity of the phenomena at both terrestrial poles suggests the question whether this is always the case.

When the writer was a lad, in perhaps the year 1834 or 5, the sky being densely cloudy and the ground covered with snow, he saw at eight o'clock one evening every visible object, especially the snow and sky, suddenly assume a bright crimson red. He wonders if any reader of *Science* recalls that memorable spectacle which appalled so many people. He does not remember to have ever seen an explanation of the ghastly phenomenon from any country where the sky was cloudless, but it was, doubtless, caused by an extraordinarily tinted aurora.

BIOLOGICAL NOTES FROM NEW ZEALAND.

BY GEO. M. THOMSON, DUNEDIN, N. Z.

A VERY interesting feature in connection with the flora of New Zealand is the rarity of those plant structures which are correlated with the presence of mammalia. If we except the spiny *Aciphyllas*, there is not a single species of plant peculiar to these islands which shows any contrivance either for distribution by, or protection against, mammals, even where other species of the same genus are so modified in other parts of the world. *Aciphylla* is a

genus of tall, rigid, umbelliferous plants, peculiar to the islands, with the exception of a rare and feeble species which occurs on the mountains of eastern Australia. The leaves and bracts of two of the species, in all their subdivisions, end in long, rigid spines, rendering them most formidable plants. The only suggested explanation for the occurrence of such strongly-armed species is that they were thus protected against the moas. This may or may not be true. It may be said in favor of the hypothesis that the moas were extraordinarily abundant in former times and they were vegetable feeders, the contents of their crops, consisting of rounded pebbles and comminuted vegetable fibres, being commonly found. It is also the case that since the introduction of pigs into the colony, these plants have been immensely reduced in numbers. The pigs root up the ground at some little distance from the plant, and so get at it from below.

But, leaving this exceptional case, we find the general statement true with which this note is prefaced. A few examples may be given. The genus *Acæna* consists of small rosaceous herbs which have undergone considerable retrogressive development. The name refers to the spines, formed of the four produced and hardened persistent calyx-lobes which project above the fruit. Of the five species found in New Zealand, two have a wide distribution outside the islands; *A. sanguisorbæ* ranging westwards across Tasmania and Australia, and reappearing in Tristan d'Acunha; while *A. adscendens* is a more Antarctic type, occurring in the Macquarrie Islands, Tierra del Fuego, and the Falkland Islands. In both these species the calyx spines are tipped with small barbed hairs, by means of which the fruit adheres to any passing animal with great persistence. In the other species of the genus which are peculiar to New Zealand, the spines have almost or altogether lost the barbs and the fruit is not distributed widely. The change is not, however, complete in all; thus in *A. microphylla* the spines are strongly developed and occasionally have reversed hairs on their summit. In *A. Buchananii* the spines are feeble and rarely have a few apical hairs, but sometimes they are not developed. Lastly, in *A. inermis* the calyx merely has its angles thickened in fruit, and there are no spines.

The only other New Zealand plants in which the fruit is carried by means of barbs which could catch on to passing animals belong to the genus *Uncinia*, a group of sedges which have the utricle furnished with a long barbed bristle or seta. This forms a most efficient organ for hooking hairs, etc., and it renders the fruit a great pest to dogs. The New Zealand species are, as Hooker says, "difficult of discrimination," and some are so closely allied to Tasmanian or to South American forms as to be almost indistinguishable. The genus is widely spread in the Southern Hemisphere, and also occurs as far north as the mountains of Abyssinia. It is clear that the barbed bristle is a character developed outside of these islands and is evidently of great antiquity. In some of the more slender endemic forms it is not very strongly developed, but I know of no species which has lost it.

Spiny and prickly plants are very rare, and, with the exception of the *Aciphyllas* already mentioned, are all Australian. *Discaria toumatou* is probably the same as the Australian *D. australis*; in this plant the leaves are small, and the branches are developed into strong spines which protect it against grazing animals. *Eryngium vesiculosum* is a low-growing umbelliferous plant with very prickly leaves and bracts, but it is a common Australian and Tasmanian species. The same remark applies to *Rubus australis*, but in this case the formidable, recurved prickles, which have earned the plant the name of "bush lawyer," are chiefly of service as climbing organs. There is, indeed, no endemic spiny plant in New Zealand (except *Aciphylla*).

The tendency to lose the protective character is shown in a most instructive manner in a few instances. Thus there are in these islands two species of the myrtaceous genus *Leptospermum*. *L. scoparium*, which is also common in Tasmania, has rigid, pungent leaves, which only an animal with a hard palate could attack with impunity. On the other hand, *L. ericoides*, which is confined to the islands, has quite lost the pungent tip to its leaves, and the foliage and branches are much softer and less rigid.

An exception to the rule here exemplified is afforded by the nettles, of which one endemic species, *Urtica ferox*, is about as

diabolical a species as can be met with. Its long, stinging hairs inflict a painful wound. It is difficult to say what they serve to protect the plant from. As if to show that perfection of protective development in one direction does not always serve in another, it is a fact worth noting that this species is so very much attacked by leaf-eating insects that it is often a matter of difficulty to get herbarium specimens quite perfect.

THE PSYCHOLOGICAL LABORATORY AT YALE.

FOR several years Professor Ladd has been lecturing on physiological psychology, using charts, models, microscope slides, etc., for illustration. His earnest desire to have a laboratory for this science finally met its fulfilment last spring. The second, third, and attic floors of a building were given for that purpose, and \$1,500 were appropriated for equipping the apartments and for apparatus. Dr. E. W. Scripture, a pupil of Wundt in Leipzig, was called from Clark University to take charge. Orders for apparatus were sent off at once, and the preparation of the rooms went on all summer, so that the work of instruction and research began without a hitch on the first day of the term.

The laboratory consists of fifteen rooms, among which are the lecture room, seminary room, library, chemical, and battery rooms, apparatus room, isolated room, time room, general-research room, and workshop. The workshop contains a screw-cutting lathe and all tools that can be desired for the repair and manufacture of apparatus. A regular mechanic is at work here part of the time. This workshop, which is the most complete one ever put into a psychological laboratory, is regarded as the foundation of research and demonstration work. The plan followed in investing the funds has been to spend as little as possible for mere demonstration apparatus and to reserve nearly all for research work; nevertheless it is of supreme importance to have the lectures on psychology consist almost entirely of demonstrations. This difficulty has been completely solved by the workshop where the apparatus for demonstration is put together or manufactured with sufficient care for the purpose.

Three rooms, including the isolated room, are given over entirely to research. This isolated room is a small room built inside of another room; four springs of rubber and felt are the only points in which it comes in contact with the outer walls. The space between the walls is filled with sawdust as in an ice-box. The room is thus proof against sound and light, and affords an opportunity of making more accurate experiments on the mental condition than yet attempted.

A particularly new feature is the electrical communication between the rooms. It is nearly always necessary to separate the experimenter from the one experimented on; in order to avoid the large number of electrical wires necessary to connect the rooms separately a switchboard has been arranged similar to a telephone switchboard, to which sets of wires run from each room. But this one with fifty-six wires has been put in with the aid of a carpenter at about one-tenth the cost of a telephone-board.

The following courses are given in the laboratory by Dr. Scripture: 1. A regular lecture course in experimental and physiological psychology of one hour per week, for seniors and graduates; the seniors alone recite on another day. 2. A laboratory course in experimental psychology for graduates, conducted on the seminary method by the men themselves. The object is not only to give a thorough knowledge of the psychological work in the laboratory, but to train the men in handling apparatus and in conducting lectures, thus providing a supply of instructors ready to take positions. This course has seventeen members, being exceeded in the graduate department only by Professor Ladd's philosophical courses. 3. Research work. It is the constant endeavor to awaken in the students the spirit of original investigation, this being what America most lacks in its educational life. Men are also encouraged on the principle that one learns most by doing. Last, not least, the fact is recognized that the amount of research done determines the standing of the laboratory in the scientific world. Already six original investigations of the highest class are under way; they include one on attention, in which

several improvements in apparatus and methods of experiment have already been made, one on the time of action and the fatigue of monocular accommodation, another on the rapidity of movement of the arm under the conditions present while writing, another on the reaction-time to tones as dependent on pitch, intensity, duration, etc.

The ample accommodations furnished by the fifteen rooms, the three months of energetic preparation during the summer, the high scientific stand taken in regard to research, the wise patronage of Professor Ladd and the enthusiasm of the young investigators lead us to hope that the first year will see us with a recognized standing, second only to Wundt's laboratory at Leipzig. Nevertheless, there are many difficulties to be overcome; the work of instruction really requires as full an equipment as a physical laboratory; moreover, research is the most expensive kind of work, thus putting a great strain on the appropriation. It would be a very great help if some one or more friends would undertake to support or aid some one of the researches, setting any desired amount as the limit beyond which the expenses are to be paid by the laboratory. We have already received considerable aid in our work: Professor Ladd has given the laboratory his valuable collection of charts and models and a microscope; a friend has donated \$75 for electric forks required in one of the researches; the B. F. Sturtevant Co. has sent a rotary blower; the Electric Gas Lighting Co. of Boston has sent a dozen Samson batteries; the Aluminium Brass and Bronze Co. of Bridgeport has made us a dozen discs twelve inches in diameter; the Boston Woven Hose and Rubber Co. has furnished some of their cross-stitched rubber belting; E. B. Meyrowitz has sent a set of test-cards, etc. More of such help would be thankfully received; at present we need a $\frac{1}{2}$ horse-power motor, a spark coil, etc. Possibly the day is not far distant when an endowment will be made for a separate building and a full equipment of apparatus.

HYBRIDISM EXEMPLIFIED IN THE GENUS COLAPTES.

BY SAMUEL N. RHOADS, ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

PERHAPS the most widespread and persistent tendency to hybridism that exists among the higher vertebrates to-day is to be found in this American genus of woodpeckers. The birds responsible for such a state of affairs are well known in their respective habitats as flickers, the eastern species being named the yellow-shafted flicker (*Colaptes auratus*), and its western congener, the red-shafted flicker (*Colaptes cafer*) by naturalists.

It early became known to explorers in the upper Missouri and Yellowstone regions of this country that where the habitats of these red- and yellow-shafted birds adjoin there often occurred individuals partaking the characters of both species. Audubon described in the appendix to his "North American Birds," a flicker from this region, with the yellow shafts and red nape of *auratus* combined with the red mustaches of *cafer*, as a distinct species, naming it *Picus ayresii*; but as more specimens were secured it became evident that these intermediate birds were not constant in character and their numbers were too great to be explained by any other theory than that they were the offspring of distinct species and were hybrids. Professor Baird enunciated this idea in 1858, classing for convenience all these nondescripts under the distinctive name of *Colaptes hybridus*, and asserting that their existence could be satisfactorily accounted for in no other way. The amount of material on which he based his theory, however, was small enough to warrant other theories, Mr. J. A. Allen attributing the existence of so-called "*hybridus*" to the "action of environment in accordance with certain laws of geographic variation," and later Mr. Ridgway suggested they were "remnants of a generalized form from which two incipient species have been differentiated." Dr. Coues, in 1884, thought the mixed birds might constitute "perhaps a hybrid and perhaps a transitional form," while Hargitt, in the British Museum Catalogue, makes the intermediates a race with the nominal status of a species under the Audubonian name of *ayresii*, admitting them to have been originally the result of a mixed union, showing possibly a "sign of reversion to remote ancestral plumage."

Last year (1891) Mr. J. A. Allen made the relationships of the whole genus the subject of an exhaustive study. The results of his examination are given in full in Vol. IV. of the Bulletin of the New York Museum of Natural History and being inaccessible to the general reader may be briefly summed as follows:—

1. Mixed birds show no stages of geographic variation comparable with those connecting species and sub-species. In the latter the transition is gradual, symmetrical, and correlated with change of environment, but in *Colaptes* the intergradation is irregular, often asymmetrical and without such correlation.

2. Very unlike birds have been found to breed together; diverse offspring being reared in the same nest by parents indifferently exhibiting normal or abnormal characters irrespective of sex. But so far typical *cafer* and *auratus* have not been found paired together.

3. On either side of the boundary of one thousand miles, along which their habitats adjoin, the influence of one species upon the other fades imperceptibly eastward and westward till it disappears.

4. The main area of hybrid distribution covers a belt of country two hundred miles wide and reaching north-westwardly from the Gulf-coast of Texas through Colorado, Wyoming, Montana, northern Idaho and Washington and the southern half of British Columbia to the Pacific, extending from southern Alaska to the mouth of the Columbia River. South and west of this the habitat of true *cafer* reaches from the Columbia to Tehuantepec, while north and east of it pure *auratus* ranges, over an area four times as great, from Florida to Hudson's Bay and from Labrador to Behring Sea.

5. Formerly, collections from certain parts of the far West, notably California and Nevada, were wanting in hybrids, but now they have become so common in some localities that thoroughbred birds are the exception. This favors the assumption that *auratus* is extending its range into the *cafer* region, and the absence of such an invasion of mixed individuals northward indicates that the transmigration is in the historic direction, from north to south.

This, with a few interpolations of my own sums up the evidence which has induced Mr. Allen and the majority of ornithologists to adopt Baird's theory to its fullest extent.

To this I wish to add a few supplementary remarks based on a collection of flickers made this year in British Columbia. As this series was chiefly collected in the breeding period we are relieved of the complications caused by the winter migration of Alaskan *auratus* into the region and can rely on the specimens as representing the domestic relations of the group.

Perhaps nowhere is the proportion of hybrids to pure-bred birds greater than on the Island of Vancouver. The dark, north-western form of *cafer* found here has so thoroughly assimilated the characters of *auratus* that *cafer* is the exception and *cafer-auratus* the rule. Nevertheless, pure *auratus* is very rare on the island. I have no specimens of it, but Mr. Fannin of the Victoria Museum has one, and Mr. Maynard of the same city states they are sometimes numerous in the fall. I am, however, from the absence of such specimens in collections, inclined to discount this statement, in the belief that they will prove to be of impure origin also. Indeed it is doubtful if there is much association, much less admixture, of thoroughbred individuals of the two species either with each other or with hybrids at the present day, many which appear pure, especially among the females, being of impure extraction.

Comparing the results of an examination of seventy skins, contained in the collections of the Academy of Natural Sciences of Philadelphia from debatable territory in the west and north-west, with the deductions given in Mr. Allen's admirable paper, the following general remarks seem in order:—

1. The prevailing tendency among hybrid flickers is in the direction of a symmetrical assumption of the characters of both species, examples of asymmetric coloration being rarely present and chiefly confined to the females.

2. A much larger percentage of male than female birds show mixed parentage. This indicates either that hybridism in this case results in an overproduction of males or a disparity in the

relative numbers of the sexes among these hybrids, or it is due to the fact that females assume abnormal secondary sexual characters less readily than males. Until it be proven that hybridism does cause a disparity in the numbers of the sexes we may safely accept the latter explanation.

3. The preponderance of hybrids showing typical coloration of *cafer* combined with the red nuchal crescent of *auratus* contrasted with the scarcity of those showing the yellow and black characters of *auratus* shows a predisposition to acquire red in that part quite in accordance with the general law of coloration in the *Picidae*, and may be considered a reversion to the characters of some common tropical ancestor from which the two species have originally been derived.

4. This tendency to assume red in preference to yellow or black colors fully accords with the southern dispersion of hybrids into *cafer* territory as contrasted with their non-dispersion into *auratus* territory.

5. The absence of records of pure *auratus* and *cafer* birds pairing together, and the abundance and evident fertility of the hybrids in some regions indicates the majority of hybrids are mongrels, i. e., the offspring of hybrid parent or parents as distinguished from those generated by distinct species.

6. It has been determined¹ that mongrels show a stronger tendency to revert to the characters of either parent than do hybrids. In *cafer-auratus* this would result in the final elimination of the hybrid element among these species. But we have seen that the tendency is toward an increase of this element.

A probable explanation of this may be found in the non-appearance of mixed characters in female hybrids by which pure-bred males are readily induced to pair with them and renew the tendency to variability.

Among the most significant queries which spontaneously arise in the mind regarding the case in hand, we may consider the following with possible profit: first, how did it happen? second, when did it happen? third, what will be the result? and fourth, what part has hybridization in the evolution or extinction of species?

Bearing upon the first question the effect of migration is of special import. In general, flickers are very hardy birds, able to resist the severest weather in sheltered localities as far north as the forty-fifth parallel. Over the country south of this the migration is less a southerly movement than a descent from the mountains into the valleys and a retreat to the densely wooded regions of the sea-coast. That the same conditions prevail on the Pacific coast I am assured by Mr. Fannin.

In the vast central territories of the continent north of the Rocky Mountains the southerly migration is more decided and far-reaching. A look at the map will show that the Rockies, after extending nearly due north through the United States from the headwaters of the Rio Grande to the northern boundary, suddenly contract from their easterly amplification in Montana and incline far to the north-west through British Columbia. South of the boundary along the eastern and western slopes of this vast landmark the migrating hosts of interior flickers of each species would respectively pass without much admixture. But in the headwaters of the Missouri region this movement becomes more complicated owing to the westerly configuration of the mountain system and the corresponding westward extension of the habitat of *auratus* north of it toward southern Alaska. Here the migratory movements of *auratus* first assume the character of an actual invasion of the habitat of *cafer*, and as we go further west the southerly migration of *auratus* from Alaska is directed by physiographic and climatic conditions to the shores of the Pacific, along which, from Sitka to California, resides the darker race of *cafer* known as *Colaptes cafer saturation*.

It is here that conditions exist more favorable to hybridism between *cafer* and *auratus* than anywhere else along the frontier of their common distribution, and it appears extremely probable that the north-west coast of British Columbia was the first witness to their notorious alliance.

Viewed thus, the history of the distribution and evolution of these species over North America becomes of special interest.

¹ Origin of Species, p. 261.

Starting with a common ancestry in the tropics and diverging northward over the great eastern and western mountain systems of the continent, they became differentiated in accord with the dissimilarity of their environments.

Readily adaptable to extremes of climate, both forms rapidly extended their northerly range into the border lands of the glacial epoch, *auratus* following its receding pathway along the Appalachian system into the Canadian lowlands and across British America in the westerly direction of the Boreal life zone, while *cafer*, spreading over the table lands of Mexico and across the Mexican boundary, reached the west base of the Rocky Mountains, between which and the Pacific it continued to extend until the changed climatic conditions of the North Pacific coast were encountered. From this point, having assumed the darker coloring of *Cleoptes cafer saturation* it rapidly extended, under more favored circumstances, until it met the southward migration of Alaskan *auratus* with the result already described.

Bearing upon the second question, that of chronology, we have first pretty sure evidence of a recent extension of the habitat of *auratus* into more southern territory, where it had not formerly been recorded. Coupled with this is discovered a growing abundance of hybrids in the same region, indicating an aggressive movement of *auratus* into new territory.

From the rate of this movement and the breadth of common ground over which these hybrids breed it would appear to be of comparatively recent inception, possibly within the last few hundred years.

Owing to the scarcity of intermediate birds in what is considered the rightful habitat of *auratus*, the transmigration has apparently come from the north and east, over neutral territory, until the habitats of *auratus* and *cafer* adjoined along a line considerably east of the base of the Rocky Mountains, following their extension into British America and crossing them about latitude 33° to the Pacific coast. At this phase of their history the two species were probably unadulterated, the mountains continuing in a modified degree to act as a natural barrier to their further extension. These conditions having now made possible the acquaintance of the species, it is for us to examine whether there were any characters shared by them in common which would predispose the birds to more intimate relations and account for their apparently anomalous conduct. As a result we find that in habits, language, size, proportions, physique, and pattern of coloration the two species are indistinguishable, while in color alone they are different. If we take any animal (man included), and endeavor to bring about a union between different species of the same genus we find that in proportion as the parties to such union resemble each other in habits, language, etc., as above given, they will the more readily accept the situation, other considerations being of no great importance.

This much as regards not only the possibility but the probability of a voluntary union between species so circumstanced. I think we must consider the interbreeding of any two species subjected to similar conditions as not only possible but inevitable. It is not in this respect that the hybrid flickers of North America are unique, but in their persistent fertility and wholesale reproduction over a large area. While this instance has no parallel on so grand a scale in the present history of species, so far as known, it is likely that similar conditions have been and are exerting an important influence in the evolution of life as we now see it.

If this be true, we cannot too curiously consider the relationships of our eastern and western flickers, as time goes on, to determine if possible the laws which govern the progress of interbreeding of species in their natural state and whether they show that hybridization has any part in the evolution of new forms or the extinction of the old.

As observed, the present tendency in *Colaptes* resolves itself into an invasion of the hardier northern race upon their counterparts of the south, with the ready absorption of the characters of the former by the latter. This cross-breeding, in accord with laws now recognized, should produce mixed birds superior in some respects to their parents, combining the hardihood of *auratus* with the handsomer coloration of *cafer* and aggressively extend-

ing their influence in a manner quite independent of the customs and traditions of either parent, just as they seem to be doing.

Whether they will come to represent a distinct yet intermediate Rocky Mountain species, with *cafer* and *auratus* occupying a diminished habitat south-west and north-east of their enlarged domains, or whether, continuing southward, they will affect *cafer* through its entire range until that species, as such, disappears, replaced by a form combining the type characters of *cafer* with the red nuchal crescent of *auratus*, is a mystery the present cannot solve and the future will be loth to reveal.

CONCERNING OUR WASTE GROUND.

BY J. T. ROTHROCK, WEST CHESTER, PA.

FEW persons, except those who have been west of the Mississippi, have any real conception of the vast areas there which might well come under the head of "Waste Ground." To eastern eyes the miles of desert seem, from any productive standpoint, absolutely hopeless. A little examination, however, may reveal the fact that such a judgment is both hasty and erroneous.

It is quite true that these regions are dry and, at present, deserts whose vegetable productions are mainly cacti, sage-brush, and various species of *Chenopodiaceæ*. It is so true, though, that the elements of plant life are in the soil, that whenever a spring or a flowing stream appears, a more or less dense vegetable growth is seen also. Hence the western aphorism that the value of a man's farm depends not on its size, but on the quantity of water he can put on it during the growing season.

This preliminary statement leads to a consideration of the subject from two points of view. 1. Are the present natural productions of no value, immediate or prospective? 2. Are we utilizing the rainfall of those desert areas to the greatest advantage? It may be said that this second question starts a vast train of secondary considerations, quite beyond the limits of this paper.

As to the first question, it is a fact that thus far mankind has depended very largely on the more fertile ground for support. This is especially true of our own country. It was, of course, in the natural trend of events that a choice between promising and unpromising areas must of necessity lead to the selection of the promising first — the fertile before the barren, that which could be irrigated before that which could not be. Increasing population has left little choice, and the first problem is, Of what value, if any, are these unattractive forms of desert plant-life? We may eliminate at once, without consideration, the sage-brush and the cacti, because they are of no great promise. The case is otherwise with the *Chenopodiaceæ*. This order of plants promises much. Its general character, to begin with, indicates latent possibilities. For example, it furnishes the beet, mangel wurzel, garden orach, and several species, also, of the mealy seeds are largely used by our American Indians as food. In South America, quinoa is an established article of food, and comes likewise from this order. Add to the above the fact that *Eurotia lanata*, another representative of the order, is a well-known and highly valued forage plant in some of the drier and more alkaline regions of our West, and the case would seem pretty clear that we have to do with an order which is well worthy of extended observation and experiment.

Here then are three points for consideration: (a) What plants of the order can be used as food, and what portions of them? (b) What does each promise in the way of improvement under *long-continued*, judicious cultivation? (c) Is there any way by which such seeds (of this order) as contain active properties can be treated so as to render them fit for food?

The fact at once suggests itself that here is a field of research, which (however promising) is mainly beyond reach of the individual observer. Time is a prime factor in the most important of the three questions. To test the capacity of any species fully for improvement would require *not less than a quarter of a century*, and, more than likely, a much longer period. It is fairly one of the problems which should be referred to a long-lived government, either for direct consideration by its own corps of experimenters, or, perhaps better still, by the agricultural colleges of each State in which such plants grow abundantly.

Among the Labiatæ (or mint family) the Chia (seeds of *Salvia Columbariæ*) appears. Its use among the aborigines dates back beyond our knowledge. We do know, however, that it was among the so-called "Aztec" races of Mexico an article of food, that it was accepted as tribute by the conquerors from the conquered, and that it still holds a place on the diet-list of the California Indians. Such, then, are some of the indications as to possible sources of food-supply which even the barren-ground portions of our country may be made to yield to an increased and hungry future population. Is it not, also, possible that desert plants, having useful properties, might be introduced, from other countries, into our own drier regions, with advantage to us?

The second part of the barren-ground problem — to obtain the largest utility from our rainfall — is already complicated by its association with existing State lines. Take, for example, the condition of affairs in Kansas, Nebraska, and Utah. Much of the water received by those States and the territory comes from the mountain slopes of Colorado, and how much of this water they shall receive depends also upon Colorado. Yet Colorado was the last of all to be settled. The continued prosperity of three earlier-settled States is contingent upon the wants, the caprice, or the cupidity of one later settled State. Clearly, there is something wrong in a political economy which makes such a condition possible. There is no probability that lapse of years will simplify the problem, and at once the question suggests itself as to whether drainage-lines should not promptly be regarded and acted upon as important factors in determining State boundaries. Here one comes in contact with political organization. All the States concerned (by their commissioners at least) must be in accord before any change of boundary can be made. And one can readily see the almost interminable line of contests, between statesmanship on the one hand and politics on the other, which such change will open up.

There is, however, another aspect from which this question can be viewed. Thus water-storage may, to a certain extent, remove the pressure of an inadequate water-supply. There seem to be certain districts, for example, that of the White Mountains of Arizona, where the rainfall is within a very few inches of enough to ensure crops. That this deficiency could be supplied during the growing season from storage basins seems more than probable. The exact method of constructing such basins so as to ensure the safety of the residents on the lower grounds is more doubtful than the benefits possible if the water were once hoarded.

NOTES AND NEWS.

PROFESSOR GEO. R. VINE of Sheffield, England, has recently distributed a report of a committee of the British Association for the Advancement of Science, appointed to investigate Cretaceous Polyzoa. In this conclusion to a series of investigations extending over a number of years, we have discussions of the species occurring in various sections, together with a catalogue of the Polyzoa found in the Chatham Chalk. In this, references are given to the original place of description of the genera and species, the classification of D'Orbigny being followed to a large extent. There is finally a catalogue of the species of British Cretaceous Polyzoa, numbering 283 species, with references to place of description and the geological or zonal distribution. Students of Polyzoa must be grateful to Professor Vine for the great amount of work he has done at various times upon this difficult group. In a second paper, reprinted from the Proceedings of the Yorkshire Geological and Polytechnic Society, Professor Vine describes and illustrates some new species, and remarks upon many others from Cretaceous horizons.

— "Mother and Child" is a compendium of modern scientific knowledge of the relationship between the parent and her family, which J. B. Lippincott Company will publish at an early day. It is prepared by Drs. E. P. Davis and John M. Keating, and contains information which is of importance to women's well-being, as well as in regard to the varied diseases of children. It is specially adapted to domestic use, but will also be valuable for trained nurses and the medical profession.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

THE GREEN MOUNTAINS' ANTICLINAL.

BY C. H. HITCHCOCK, HANOVER, N.H.

THE key which is to unlock the intricacies of New England geology is to be found in the discovery of the proper structure of the Green and Hoosac Mountains. Hence in the occupation of this field for careful investigation the United States Geological Survey has acted wisely; and one cannot restrain impatience with the officials of the printing office, who have had the completed manuscripts descriptive of these results in their hands for more than two years, and have not published them.

The pioneers of American geology referred this Green Mountain range to the "Primary" series, chiefly because, in their view, all foliated crystalline rocks belonged there. Of course any sections illustrative of their notions from the theoretical standpoint would exhibit the anticlinal structure. But their actual illustrations, compiled from observation, do not support their theory; as shown by C. T. Jackson's section across the White and Green Mountains, and E. Hitchcock's sections across the Hoosac Mountain. Hence it was that the geological literature of thirty and forty years' standing is pervaded with extreme applications of metamorphism. C. B. Adams, in the second report upon the geology of Vermont, in 1846 (p. 163), raised the query whether the occurrence of the quartz rock, limestone, and talcose schists upon the east side of the Green Mountains, in Plymouth and elsewhere, did not include the repetition of the Taconic rocks over an azoic foundation. He offered this suggestion as something worthy of investigation. His successors in the study of Vermont geology attempted to discover the structure of the mountains, as well as of all parts of the State, by measuring thirteen sections across the territory from east to west. A summary of the results was given by E. Hitchcock in the final report, page 252; from which it would appear that the structure of the Green Mountains was anticlinal. His contemporary, Logan, insisted that this structure was synclinal. The later studies of the writer, in several publications, confirm the first view, which is also held by Selwyn, the successor of Logan as director of the Canadian Geological Survey.

Having had occasion recently to examine the rocks of Hoosac Mountain and the neighborhood, the writer desires to offer the following observations. The excavation of the Hoosac tunnel has afforded us the opportunity of observing the structure of the interior of this mountain compared with what may be seen at the surface; and it was stated in Macfarlane's Railway Guide, 1879, that Hoosac "Mountain is believed to be an inverted and very much crushed anticlinal." Professor R. Pumpelly, in his paper upon secular rock-disintegration in the Bulletin of the Geological Society of America, vol. II., presents a map covering a part of this mountain, which shows the distribution, first, of a central core of granitoid gneiss; second, a coarsely foliated, often white, gneiss, supposed to be the dynamic product of a Cambrian conglomerate; third, the Hoosac schists, which wrap around and over

the gneisses; and, fourth, the quartzite, which is the basal member of the Cambrian, known familiarly as the "granular quartz" of Emmons. The anticlinal fold is therefore easily recognized. The granitoid gneiss in the centre crops out upon the mountain a mile or so south of the tunnel, and the arch dips ten degrees northerly, and the rock is exposed where cut by the excavation. It is made up of blue quartz, large microcline crystals, somewhat elongated and assuming the augen habit, together with the greenish mica, chlorite, and epidote of the foliation. It is said to be the equivalent of the gneiss of Clarksburg Mountain. The Vermont geology described this rock as the Stamford granite (gneiss), and speaks of it at several places farther north also. Our New Hampshire studies enable us to correlate this central granitoid augen gneiss with the "porphyritic granite, or gneiss," said to lie at the foundation of the stratigraphical column. In New Hampshire the mica is commonly biotite, while the greenish micas at the tunnel are more suggestive of the later protogene, called "Bethlehem gneiss." As the chloritic mineral is the result of alteration, its presence is not definitive. But the augen gneiss seems to constitute the foundation upon which the later gneisses were disposed in both localities.

There must be a decided unconformity between the augen and the overlying white conglomerate gneiss. This is shown not so much by a decided divergence in the angle of dip as by the general principle that a conglomerate is necessarily unconformable to the original rock from which the fragments have been derived. Some would say the augen gneiss was of igneous origin; and, if so, the discordance would be equally marked.

This Hoosac gneiss, or its equivalent, must be manifested in the Shelburne Falls anticlinal area, the Halifax-Reading ranges, and others farther east and north. Each range has the anticlinal attitude, while the intervening basins are of newer rocks. Next to the Green Mountains structure, the succession of gneissic waves capped by hornblende schist have aided us in working out the stratigraphy of the New England crystallines.

The proper place for the Hoosac schists may be an open question. E. Hitchcock, in his map of 1844, made the Graylock, Hoosac (west side), and the Charlemont schistose areas equivalents; and perhaps this is the most natural view. We must, however, remember that these hydro-micaceous and chloritic schists are not confined to a single horizon. There are, first, those of the Green Mountain gneiss, described as pre-Cambrian; second, those of the granular quartz, or Lower Cambrian; third, those of the Berkshire and Graylock terranes, as pointed out by Dale, and corresponding to the magnesian slate of Emmons. Hence there may be reason for the reference of the Hoosac schists to any of four different horizons that best explain the dips.

The Stockbridge limestone is evidently repeated on the east side of the anticlinal at Plymouth, Vt. Whether it once extended along the whole range and has been eroded, or is represented by an equivalent terrane, or is wanting, remains to be discovered.

BOTANY AT THE EXPERIMENT STATIONS.

BY GEORGE F. ATKINSON, BOTANICAL DEPARTMENT, CORNELL UNIVERSITY.

A REMARKABLE stimulus to botanical investigation has been given in the last few years through the opportunities offered by the organization of botanical departments at the various State experiment stations. The acquisition by the States of the congressional fund has afforded means, hitherto possessed only by a few favored institutions, for the purchase of the expensive apparatus and libraries of technical works needed in modern biological research. It also provides for the employment of men who devote part or the whole of their time to original study and the practical application of the results. The fund was designed not only for the purpose of treating economic botany in a practical way, but also for the purpose of pure science study, which in many cases must precede any practical treatment.

Studies of forage plants, of the improvement of sorts by the selection of seed, cross-fertilization, the distribution and harmfulness of weeds, the relations of micro-organisms to the fertility of soils, besides many subjects appertaining more or less to horti-

cultural science, are some of the subjects which engage the earnest efforts of the station botanist.

Perhaps one of the most unique features of the botanist's work at the experiment stations is the study and treatment of plant diseases caused by fungi and bacteria. Nearly all the stations where a botanist is employed give considerable attention to experimentation in various ways for preventing or remedying plant maladies. This is certainly called for, at least the experiment stations should in some way carry on such experimentation, for the prevention of plant diseases is the desired good for which any appropriation for this study is given. There is also a popular demand for results which mean dollars and cents saved for the farm and garden. In some cases, perhaps, this necessitates a sacrifice of the careful study into the cause of the disease. It is gratifying, however, to note that at a number of the stations the importance of original investigation into the cause of plant diseases is recognized. Already important results have been reached. Important in clearing the way for successful treatment, but also important contributions are being annually made to the biology of little-known and obscure forms of plant life. In such a large number of recently organized stations, much chaff will be published, but time will winnow that from the kernel.

In looking over the work of the station botanists, it is interesting to observe the number who are engaged in making use of artificial cultures in studying the life histories of parasitic fungi. The different habits and appearances of the real enemy are brought to light, its plans of attack are studied; proof of its harmfulness can be established by inoculation, and known causes thus supplant supposed ones. No other feature of botanical work at the experiment stations, in my judgment, is doing so much to lay the permanent foundations for a rational economy in the treatment of plant diseases. The best work of this kind can only be successfully carried out with the aid of expensive modern apparatus appertaining to bacteriological laboratories. This provides the trained workman with the tools for proceeding rationally and accurately to the desired end. The stations which at present are provided, more or less completely, with such cultural apparatus are the following:

Alabama, Connecticut (New Haven), Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Massachusetts (Amherst), New Jersey, Cornell University Station, N.Y., New York Station (Geneva), North Carolina, North Dakota.

Several workers in other stations feel the need of cultural apparatus in their work. It is to be hoped that another year will find this want provided for.

During the past year the force of botanical workers has been increased by the organization of departments at the following stations: Arizona, Florida, New Mexico, South Dakota, and Texas, the officer at the latter place being horticulturist in charge of botany.

Several changes have been made in the working force. At the Alabama station Atkinson retired Oct. 1, 1892. At the Kansas station Hitchcock was appointed to succeed Kellerman. In Massachusetts, Humphrey retires January 1, 1893. In Michigan the station work has been reorganized and C. F. Wheeler appointed botanist. Craig has been made botanist in Oregon. In New York, at the Cornell University Experiment Station, Dudley retires to accept a position in Leland Stanford, Jr., University, and Atkinson of Alabama has been appointed cryptogamic botanist.

In looking over the report of the chairman of the Section of Botany of the American Association of Agricultural Colleges and Experiment Stations, which met at New Orleans Nov. 16, we note the work of the botanists at the different stations as follows:—

Alabama. Mell (botanist and meteorologist in charge of phanerogamic botany) is engaged upon a study of the economic grasses and weeds of the State, and in crossing varieties of cotton.

Atkinson (biologist in charge of plant pathology) has continued his studies of cotton diseases, has discovered a new "damping-off" fungus, obtained pure cultures of Pammel's *Ozonium* of root-rot of cotton in Texas, is studying the biology of the organisms which cause leguminous tubercles, and the teratological growths caused by *Taphrina*, *Ræstelia*, and root fungi.¹

¹ For continuation see Cornell University Experiment Station, N.Y.

Arizona. Tuomey (botanist) is making observations on the adaptability of the native grasses, trees, and shrubs for cultivation.

California. Green (botanist) is at work upon the vast native flora of the State.

Connecticut (New Haven). Sturgis (mycologist) is studying the diseases of tobacco, and making experiments in curing tobacco and spraying fruits and garden crops. He is beginning a critical study of the *Cribbriaceae*.

Delaware. Chester (mycologist) is engaged upon studies of *Monilia fructigena*, diseases of watermelons, muskmelons, cucumbers, and the winter killing of blackberries. He has reached promising results in the treatment of peach-rot.

Florida. Rolfs (botanist and entomologist) has recently entered upon his duties, studying plant diseases.

Illinois. Burrill (botanist and horticulturist) is studying bacterial diseases of plants; raspberry rust, *Manilia* of plum, and economic smuts.

Indiana. Arthur (botanist) is investigating the normal growth of the potato, the relation of the number of eyes on a tuber or part of a tuber to the number of stalks produced and to the yield. Is also studying the enzyme in seeds of wheat and oats, the relation of green seed to early maturity, wheat-smuts, and has devised a method of preventing rust and bacterial disease of carnations.

Iowa. Pammel (botanist) is studying life history of *Peziza sclerotiorum*, *Rhizoctonia betæ*, and *Cercospora beticola*. Has experimented on effect of fungicides upon roots and germination of seeds, crossing of cucurbits, treatment of plant diseases, and is at work on the chromogenic bacteria of the Ames flora and anatomy of cucurbits.

Kansas. Hitchcock (botanist) is experimenting with fungicides on seeds, and studying the biology of weeds and economic *Uredineæ*.

Kentucky. Garman (entomologist and botanist) is engaged upon comparative study of forage plants.

Maine. Harvey (botanist and entomologist) is making collections of economic plants.

Massachusetts. Humphrey (vegetable physiologist) has been studying black-knot of plum, a violet disease, a new disease of cucumbers, and is publishing a monograph of N. A. *Saprolegniaceæ*.

Mississippi. Tracy (director and botanist) is making a botanical survey of the State, and working on the *Gramineæ*, southern tomato blight, and a new disease of the grape.

Nebraska. Bessey (botanist) is making an exhaustive study of the native trees and shrubs, and native and cultivated grasses. Is at work on diseases of the sugar-beet.

New Jersey. Halsted (botanist and horticulturist) is working on diseases of cranberry, rose, violet, hazel, and fungi of weeds, and experimenting for treatment of celery and sweet potato diseases.

Cornell University Station, N.Y. Atkinson (cryptogamic botanist) is engaged upon a study of winter blight of tomatoes, a new tomato disease, a *Botrytis* disease of beans, carnation diseases, a new anthracnose of *Ligustrum*, and "damping off" fungi.²

New York (Geneva). Beach (horticulturist) is studying the effect of copper compounds in soil on vegetation, has obtained good results from Bordeaux mixture and selection of seed for anthracnose of beans, and from Bordeaux mixture for *Septoria* on chrysanthemums. Has treated also apple and potato scab, raspberry anthracnose, gooseberry mildew, strawberry-leaf blight, and celery diseases.

New Mexico. Wooton (botanist) is collecting plants for an herbarium.

North Carolina. McCarthy (botanist) is engaged in seed-testing, treatment of grape and tomato diseases, and studying bacteria of nitrification.

North Dakota. Bolley (botanist) has found corrosive sublimate effective in preventing potato scab; is studying the fungus of deep scab of potatoes, making attempts at artificial cultures of the *Uredineæ*, and working on the distribution of root tubercles of the *Leguminosææ*.

Ohio. Miss Detmers (botanist) is collecting the *Uredineæ* of the State.

² See also Alabama.

Oregon. Craig (botanist) is working on weeds, forage plants, and plant diseases.

Pennsylvania. Buckhout (botanist) is engaged in forestry and hybridization, and working on the practical side of potato-rot and downy mildew of the grape.

Rhode Island. Kinney (horticulturist and acting botanist) has reached important results in the treatment of seed-potatoes with Bordeaux mixture to prevent potato-scab; is also treating seeds.

South Dakota. Williams (botanist) is making observations on forage plants suited to varying conditions in different parts of the State, and studying plum-pockets and a geranium disease.

Tennessee. Scribner (director and botanist) has published a list of the grasses of the State in the form of a popular edition, to be followed by a more technical one.

Texas. Price (horticulturist) is treating cotton and grape diseases.

Utah. The entomologist is acting-botanist.

Virginia. Smythe has charge of phanerogamic botany. Alwood (horticulturist) is studying apple-leaf diseases and experimenting on weak solutions of copper salts for plant diseases.

Vermont. Jones (botanist) has made a test of the comparative value of a number of the standard fungicides on potato-rot (*Phytophthora infestans*).

Wisconsin. Goff (horticulturist) is working on apple-scab and experimenting on the germination of seeds.

Mention should also be made of the work of the Division of Vegetable Pathology, Department of Agriculture, Washington, with its corps of half a dozen workers carrying on important and fruitful investigations, the larger subjects of investigation at present being a mysterious vine disease in California, orange diseases in Florida, and fruit diseases in New York.

A large number of the experiment station botanists do more or less teaching, since most of the stations are connected with, or located near, the State agricultural colleges. This large field of work for specialists offers one of the best openings for young men desirous of becoming either investigators or teachers. New fields are opening each year and changes are being made, so that for some time there will be a demand for young men not only well trained in general botanical science, but those who also have improved the opportunities presented for familiarizing themselves with methods of artificial cultures of micro-organisms and fungi. The call for original investigation at the experiment stations implies with it better equipment than would possibly be supplied under other circumstances at many of the State colleges. This affords, then, the ambitious teacher good facilities for being at the same time an investigator, while it also offers the investigator good opportunities for experience in teaching.

This dual responsibility becomes burdensome if too much of either is required without ample assistance; but, in many cases, teaching duties are lessened in order to give time for the investigation. When the burden is not too great, an ambitious young man with strength and enthusiasm is likely soon to be promoted to greater positions of trust carrying a less number of the more irksome duties.

THE RETICULATED STRUCTURE OF HUMAN RED BLOOD-CORPUSCLES.

BY DR. ALFRED C. STOKES, TRENTON, N. J.

WHATEVER the histologist may believe in regard to the reticulated structure of the human red blood-corpuscles, whether he accepts it as normal structure or not, he cannot fail to be impressed by the beauty of the minute plexus of fibrils, or to be gratified by the ease with which the net-work structure will explain certain physiological problems. But since Dr. Louis Elsberg, in 1879, first announced his discovery of this structure in the human red corpuscles, the subject seems not to have attracted, among histologists, the attention it deserves. It has been ridiculed by some, just why I have never understood, as the announcement was certainly of sufficient interest to merit further investigation in all seriousness, and while some prominent histologists were disposed to accept Elsberg's observations as

demonstrable, his conclusions were pretty generally waved aside with scant courtesy. Klein, of England, seems to be one of the believers in the existence of the reticulation within the red blood-corpuscles as normal structure, while Ranvier, the learned French histologist and professor in the College of France, dismisses the subject in a single sentence in his treatise on human histology, saying that the reticulum is an illusion produced by wrinkles on the surface of the corpuscle, and letting it go at that. Ranvier's dictum should properly dispose less well-informed students to be cautious in their statements, and especially in their belief in what their own eye sight seems to show them. Yet after the corpuscles have been exposed to the action of a five per cent solution of potassium bichromate, the reticulated appearance is so distinct, it is so constantly present, and the most authoritative investigators are so sure that the bichromate of potassium in solution can have no deleterious effect on the most delicate protoplasmic structure, that in the mind of every microscopist that sees the reticulations in the red corpuscles from his own blood, there must be an unconquerable doubt as to the correctness of Ranvier's opinion and assertion. The net-work, or the corrugated surface, is so exceedingly minute, even when studied with the best high-power objectives, that mere superficial examination can scarcely hope to decide whether the appearances are due to wrinkles on the surface, or to a reticulation below it, although the aspect is certainly much less like a wrinkling than like a reticulum. The net-like collection of fibrils is too regularly and too evenly developed to impress the observer with the belief that it is a collection of wrinkles only or even chiefly.

The action of water on the red corpuscles in such that they soon become inflated and finally invisible. They are not dissolved but are rendered invisible, as a drop of any aniline stain run under the thin glass covering these invisible bodies will demonstrate, by again bringing them into view. The five per cent solution of potassium bichromate also distends the corpuscles, not to the same extent, it is true, as does water alone, yet the distention is conspicuous. It is natural, therefore, to suppose that, although the reticulations and the bodies bearing them are not even microscopically large, yet if the appearances are due to a net-work of surface wrinkles produced by the potassium salt, the absorption of the water carrying the salt, and the consequent distention of the corpuscle, should have a tendency to lessen the number of the wrinkles and likewise to lessen their prominence, but this is not the result.

To investigate the subject for my own personal gratification, I submitted red blood-corpuscles to the action of a five per cent solution of potassium bichromate for an hour, then transferred them to a cell of some depth in which was an exceedingly weak solution of the same salt, hoping that the action of the water would still further distend the corpuscles and, at least to a certain extent, obliterate the surface markings, if they were such. In numerous corpuscles the result was that hoped for, so far as distention was concerned, the bodies in many cases becoming almost globular. A touch of a fine needle-point on the cover-glass rolled over and over beneath the objective, yet, distended as they were, the reticulation was in no way undefined nor uncertain. It surely was not less conspicuous; it actually seemed more prominent, an effect readily explainable by the elongation in all directions of the internal fibrils, if they existed, and the consequent enlarging of the inter-fibrillar spaces.

By pressure on the cover-glass it is not difficult to crush such distended corpuscles, and, although the result is always an indescribable deformity, the reticulation is still to be seen plainly in some specimens, and to show some traces of its existence in all.

Under such circumstances, too, it is not impossible to cut a corpuscle in two by drawing a fine needle across the thin cover-glass. In my experiment the needle cut only a single one of the sub-spherical globules, it is true, but that separation was accidentally accomplished so completely, and the two parts were studied so long and carefully, that there remains no doubt in my mind as to the correctness of the observation or of the interpretation. A single globule had been cut, not entirely into two parts, but so nearly in two that the currents in the medium had lifted

one portion and thrown it aside, at the same time twisting the little ligature still connecting the parts, the effect being such that the two might be compared to two watch-glasses adherent at one side by the edges, but with the concavity of one directed away from the convexity of the other, the two concavities therefore looking in opposite directions. If there ever was a chance to look into the interior of a distended and sectioned red blood-corpuscle this was it, although the whole was the result of a fortunate accident and of nothing else. It was good luck with no good management, for I could never repeat the experiment with even a similar success. But with an achromatic condenser, N. A. 1.0, and with Reichert's semi-apochromatic, oil-immersion one-twelfth inch objective, N. A. 1.40, each of those two parts of the same red corpuscle was seen to be filled with a distinct and conspicuous reticulum, as a saucer or a watch-glass might be filled with a flat-topped sponge.

The result of this effort at rough-and-ready cutting of the red corpuscles was so pleasing, that the thought of a deliberate sectioning with a microtome was fascinating, and the hope of a still more perfect exhibition of the reticulum within the sections was too great to be long postponed. It is, of course, impossible for the most expert microtome to select a red corpuscle, put it into position on its narrow edge after having submitted it to the action of the bichromate of potassium solution, to embed it, and then to slice it up in the microtome. A section parallel with the broad surfaces of the corpuscle would not answer the purpose, and indeed, if such a section could be made, the microscope and the microscopist himself might remain blind to the result. It would hardly be possible to know that such a section had been produced, since the microscopical appearances of the entire, uncut corpuscle must be similar to any section possibly made in the direction mentioned. The cutting must therefore be done in a direction transverse to the broad surface of the corpuscle, that is, at right angles to that aspect. Even to cut once across an object only $\frac{1}{32000}$ inch in diameter would be impossible with but a single specimen to work on. The method that occurred to me is one that would naturally occur to any one, and when I suggested it to my correspondents, Mr. Ludwig Reiderer of New York City and Dr. Edward Gray of Santa Cruz, California, they kindly promised to make the experiment and to send me the resultant slides, as they did. The method was simply to submit a large amount of blood to the action of a five per cent solution of potassium bichromate, and to embed a large quantity of the corpuscles without any other preparation, the belief being that some of the numerous corpuscles would place themselves in a position to be sectioned transversely. The tendency of these special objects is to arrange themselves so that the broad surfaces shall be horizontal. If, then, the embedding medium containing them should be turned over, so that the knife should pass through it at right angles to its plane upper surface, the chances were that some of the corpuscles would be sectioned as desired, and at least once across. More than one section of a single corpuscle was not even dreamed of. The results justified the expectation. While not many corpuscles were sectioned, I still found fourteen on one slide, some being admirably cut. These were enough to give an opportunity to look into the interior, and to show that my rough-and-ready method of cutting with a needle-point on the cover-glass, although only an accident, gave as correct a picture of the structure as the more elaborate methods of my correspondents, which, of a truth, were almost equally only an accidental success.

A section of a red corpuscle set up on its narrow uncut edge and looked at from above, that is, with the cut surface upward, is not always panduriform in outline after treatment with the bichromate solution. Whilst some are perfectly pandurate, the majority are variously changed in form by the potassium salt, the outlines being semi-circular, plano-convex, concavo-convex, or "crossed," that is, double convex with the convexities of different curvatures. The specimens panduriform in outline were few in number in these experiments, but they did exist, and were studied with rather more satisfaction than were the other forms, which, although not having the normal outlines, were not altered in structure, if the histologists are correct when they assure us

that the bichromate of potassium has no deleterious action on protoplasm.

These as well as all the sections were carefully and repeatedly examined with light passed through blue glass, and with the achromatic condenser and the oil-immersion objective already mentioned. The result justified the conclusion reached by means of the happy accident that I have referred to so repeatedly. The apparent reticulation is a true reticulation and in no way a surface wrinkling. The net-work is made up of minute fibrils that produce an internal reticulum that, at least after the action of the bichromate salt, fill the entire internal part of the human red corpuscle. Upon the thickened, firmer surface that simulates an external membranous cell-wall, even after taking into consideration unavoidable diffraction effects, there is no evidence of a wrinkling. On the surface of certain of the corpuscles that were accidentally set upright, that is, vertically on their narrow edge, but escaped the knife, there were absolutely no signs of any roughness or of any wrinkling. The surface outlines were as smooth and as even as they could possibly be. I am convinced that the reticulation, under the effect of the bichromate of potassium solution, exists, not on the surface but within the body of the human red blood-corpuscle; and if the potassium salt has no deleterious effect on protoplasm, then the reticulation is a normal structure, and the net-work of protoplasmic fibrils is a natural and constant constituent of the red blood-corpuscles. Yet the doubt is great and prominent. How that doubt is to be dispelled I must leave to microscopists that are more expert histologists than am I.

In all the corpuscles lying horizontally on the slide a nucleus-like body was conspicuous, the net-work of fibrils being always connected with it, the nucleus-like body being itself circular in optical section and inconstant in position. In but two corpuscles that had been certainly cut transversely was a nucleus-like body observable. In others, if it existed the section did not happen to pass through it. In one of the two instances referred to, there were two minutely elliptical bodies present, one near each extremity of the section, whilst in the other only a single object of the kind was visible near one end. If a nucleus exists in the red blood-corpuscles, judging from these two examples, it is disciform, as would naturally be supposed. That the appearance should be so prominently visible in most of the corpuscles thus treated, is at least suggestive.

There is in connection with this internal structure a question that should be answered, or at least investigated by those that have access to the murderers in New York State, of whom there are usually several on hand. What is the effect, if any, of the fatal electrical current on the reticulation? That the corpuscles are altered in size and in shape is well known, especially to those that have seen the preparations of the blood from William Kemmler, the first murderer executed in the electrical chair. But nothing was at that time done to learn if there had been any change in the reticulations within the corpuscles, and, so far as I know, nothing of the kind was even thought of. To remove a sufficient quantity of blood that had certainly been under the influence of the electrical current, and to subject it to the action of the bichromate solution, would not be difficult for any competent microscopist that might have access to the criminal's body immediately after the execution. That the reticulations exist within the corpuscles I am convinced; that the electrical current would make a change of any kind in those reticulations is one of the many things that I should like to know. The investigation, too, might go some distance toward deciding as to the normal existence of the net-work. If the killing current alters the corpuscles in form and in size, as it does, it is reasonable to suppose that changes should take place in the internal structure, if there normally is any internal structure. There have been many widely differing kinds of suggestions as to what practical use murderers should be put; there seems to be a desire to make them of some service after death or even before death, for scientific experiments. Some competent microscopist within convenient distance of New York's State Prison at Auburn, may thus make good use of one murderer by investigating this interesting question.

Histologists claim to have proved that a solution of potassium bichromate does not alter the structure of protoplasm. If this be

true, then the reticulation within the red blood-corpuscles is a normal structure; if not true, then the whole body of histological work which has been accepted as correct must be doubted and be revised, because about the first thing the histologist does with his specimen is to plunge it into a solution of potassium bichromate. Indeed, he does more, for he not rarely uses Müller's fluid, which is a mixed solution of potassium bichromate and of sodium sulphate. There seem to be two horns to the dilemma, and the microscopist that seizes either is likely to be gored by the other.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The Cretaceous at Gay Head, Martha's Vineyard.

IN his article on "Gay Head," published in this journal of Sept. 23, and since supplemented in the Transactions of the Maryland Academy of Sciences (pp. 204-212), my friend Professor Uhler furnishes a valuable contribution to the geological literature on that peculiarly interesting promontory, through applying to the task of unravelling the complicated structure of the Vineyard series the knowledge and experience gained in his painstaking and excellent studies of the Lower Cretaceous terranes between New York Bay and the James River. Professor Uhler is the first, in print, to apply, in the interpretation of the disturbed strata in the western portion of Martha's Vineyard, the general principles which he was first to discover in the mode of disposition of the same series in the Middle Atlantic States. To one somewhat familiar with the Middle and Lower Cretaceous of New Jersey and Maryland, the homologies forcibly indicated in the Vineyard series are full of fascinating interest.

While agreeing with Professor Uhler as to the general structure of the original Cretaceous series in Martha's Vineyard, i. e., in the existence of a lower portion, essentially clays, succeeded by deposits of sands, lignitic clays, often somewhat laminated, and alternate clays and sands,—the observations of Professor Shaler and those of us who have viewed the cliffs for several successive seasons have taught the fallibility of indulging in a detailed correlation of the entire section as exposed during a single summer. Each season presents new phases and unsettled local stratigraphic complications, revealed by the winter's storms, as may be noted by consulting Professor Shaler's very valuable memoir, published in the Seventh Annual Report of the U. S. Geological Survey (pp. 297-363, 12 plates), the same author's paper in the Bulletin of the Geological Society of America (Vol. I., pp. 443-452, pl. ix.) (neither article is mentioned by Professor Uhler), or in my notes made during 1889, 1890, and 1891. It seems to me, therefore, that Professor Uhler has been a little confident and hasty in naming up the various terranes at Gay Head. In offering some friendly comments on his conclusions, it is not my purpose to discuss several important questions, such as whether the island has been submerged "five times" or only three, or matters of nomenclature, as, for example, whether the underlying clay series should be called "Potomac" or Amboy, or the more arenaceous portion designated as "Raritan," "Albirupean," etc. These questions, as well as those concerning unconformability and the order and relations of the various members of the lower half of the Cretaceous in this region, as well as in other Atlantic coast States will, I trust, soon be considered in full by Professor Lester F. Ward of the U. S. Geological Survey, who has made them the subject of special study, and who is far more competent to discuss them than the present writer. The folding, crushing, faulting, and dislocations at Gay Head make a unique example in the Cretaceous and Tertiary of the eastern United States. It is difficult to account for the surprising altitudes of the clays and lignites, as well as extensive elevation and pre-Tertiary erosion, with no other agency than pressure and the encroachment of the sea. In fact, the strata are so disturbed, eroded, mingled with, and masked by, post-Cretaceous deposits that it is, in my opinion, hazardous, in many portions of the section, to attempt more than the application of

the general principle of distinction between the lower portion, with more massive clays, and the upper part, embracing variously arranged clays and sands.

The greensand toward the north end of the section is much contorted, as described; but my own excavations in search of fossils fail to corroborate my friend's hypothesis that the Tertiary fossils "have settled into the broken surface," the interior of the marl being, in his judgment, equivalent to the lower marl of New Jersey, and carrying Cretaceous fossils only. If such is the explanation of the occurrence of Tertiary fossils on the face of the greensand, it is remarkable that they have not, likewise, settled into the broken surface of the clays and sands on either side. A similar marl was seen well exposed in the season of 1889 at one or two points towards the eastern end of the Weyquosque cliffs in Chilmark, where at one place the materials in the margin of the terrane appear to have been beautifully sorted in Pleistocene or post-Pleistocene time.

With Professor Uhler I agree that the greater portion of the strata below the "ossiferous" conglomerate, which appears to be Miocene, is probably Cretaceous in age. As to whether the more massive clays are equivalent to the plastic clays of the Potomac in the Maryland region, I shall not question in this place, merely mentioning the occurrence of Dicotyledonous remains among the dark clays at high-tide level near that portion of the section which I understand my friend to pronounce Potomac. It is possible, of course, that this terrane had slipped down from the upper part of the cliff, and may be regarded by Professor Uhler as "Raritan." The latter name suggests the remark, that, while referring the lower clays to the "Potomac," and explaining that the superimposed series, called "Raritan," is equivalent to the upper part of his "Albirupean," Professor Uhler makes no mention of the presence or absence of the rest of, or the lower portion of, the Albirupean, theoretically intervening between the Raritan and Potomac as defined by him.

So far as I now know, my paper on "Cretaceous Plants from Martha's Vineyard," read at the December meeting of the Geological Society in 1889,¹ was the first in which the opinion was expressed, or evidence adduced to show that a part, at least, of the Vineyard series represents an eastward extension of the Amboy clays to the southward of New England. The opinion expressed by Dr. Newberry, when delivering his judgment on my drawings, that "there can be no doubt that they represent the flora of the Amboy clays," and his view that these clays passed through the entire length of Long Island, have, I think, been fully justified. During the following summer, 1890, evidence was collected which proved the correctness of those views regarding the Gay Head region, while my unpublished notes, made the same season, indicate the extension of the Amboy clays in place as far east as Northport and Fresh Ponds in Long Island, while material probably derived from that series, when not in place, was observed at numerous points, among which are Wyandance, Farmingdale, possibly near Riverhead, and in Gardiner's Island. I anticipate that a careful search among the Pleistocene material between the Firehole and Montauk Point will reveal Amboy elements, showing a continuance eastward to the Cretaceous material observed by myself in the north-east and south bluffs of Block Island. On Martha's Vineyard the Amboy clays may be seen in place at several points in the vicinity of Peaked Hill, while its material, perhaps re-deposited, may be traced to Lambert's Cove, or farther. Concretions with Amboy plants have been collected on the shore of Lagoon Pond, above Vineyard Haven, while Professor Thomas Battey of Providence has sent me similar specimens from East Chop and Cottage City, on the east coast, showing the probable extension, in past if not in present, of that important series of clays and sands as far, at least, as the eastern border of the island.

The greater identity of the Amboy (Middle or Lower-Middle Cretaceous) flora with that of the Lower Atane beds of Greenland, instead of with the Dakota group of the United States, is remarkable,² and strongly impels one to search for other evidence

¹ Abstract, Bull. G. S. A., I., pp. 554, 555; Printed in full in A. J. S., xxxix., 1890, pp. 93-101, pl. II.

² See A. J. S., I., c., p. 99, and Newberry's remarks, Bull. G. S. A., I., p. 555.

of a middle or lower Cretaceous connection with Greenland, an hypothesis fully in harmony with the views of a connecting offshore Tertiary terrane, advanced by certain Neocene palæontologists.

There remain still many problems in the stratigraphy and chronology of Gay Head. Next year will doubtless offer opportunities for fresh conclusions, at least on subordinate points, to my friend or any other geologist. There may even be good reasons for the sincere entertainment of almost fundamentally different opinions on the part of an equally skilful observer.

Among other problems, not merely local, is the circumstance that, notwithstanding the incompatibility and irrationality of the idea in view of present continental geography and topography, no other inherent evidence has, I believe, been found as to the deposition of the clays and sands of this series except such as tends to support the view of Professor Uhler that these middle or lower Cretaceous terranes are essentially fresh water formations.

DAVID WHITE.

Washington, D. C., Nov. 16.

On the Vernacular Name of the Genus *Harporhynchus*.

THAT well-known genus of American birds, of which *Harporhynchus rufus* is the type, is almost universally called in English, by every ornithologist, or indeed by every one who knows the species in the United States, a *Thrasher*. In New England, and to the southward and westward, it is known as the Brown Thrasher. We find it printed Thrasher in the A. O. U. Check-List, without any synonymic term or terms, as is also the case in such an authoritative work as Coues's "Key to North American Birds." Now it is of interest to know that our British ornithological friends call these birds Threshers, spelled with an *e* in the first syllable, instead of an *a*. Recently Professor Alfred Newton submitted me the proof of a contribution of mine to his extensive work on Ornithology, now passing through the press, wherein this word occurred,—spelled Thrasher in my text, but Thresher in a supplementary note of his own. Upon his attention being called to it, I received from him the following in his reply: "I have not the least wish to interfere with your use of Thrashers,—there is some authority for it among English writers,—but I believe Thresher to be more correct (A. S., perscan or pirsan; Mid. Engl., preschen; Chaucer, threschen; Scal., preskja; Old Dutch, derschen; Germ., dreschen; Gothic, thrishen) and prefer that form for my own use—though, of course, giving it the sound of short *ä*, as in many other words, e.g., Derby. Thrash would seem to indicate a pronunciation like Thrāsh (almost thrarsh)—which is local and vulgar. A. N." This communication is dated Magdalene College, Cambridge, England, Nov. 12, 1892. According to this it would seem that our old, time-honored name of Thrasher, strictly speaking, should give way to the more correct appellation of Thresher.

R. W. SHUFELDT.

Takoma, D. C., Nov. 29.

Meteoritic Shower.

THE meteoric shower here on the evening of Nov. 23 was very fine. The average of several observations, from 7 to 10 P. M., gave 250 good-sized meteors per minute, with a great many very small ones resembling a fiery dust. The meteors appeared to radiate from a point nearly overhead at 9 P. M.

C. W. KEMPTON.

Austerlitz Mine, Oro Blanco, Pima County, Ariz., Nov. 26.

Remains of the Mastodon Recently Found in Tennessee.

NEAR Niebert's Springs, seven miles south-east of Knoxville, some workmen recently unearthed four molar teeth of the mastodon, which were in a fair state of preservation. They were found beneath about thirty inches of yellow tenaceous clay, containing water-worn stones. The largest tooth measured sixteen inches in circumference, and bears on its grinding surface one small and four large ridges, which are covered to the depth of one fourth of an inch with perfectly preserved enamel. The smallest tooth measures twelve inches in circumference, and has only three transverse ridges, whose surfaces are so worn as to expose the

dentine in a number of places. The roots are so decayed and broken that it is impossible to determine their original length or number.

The University of Tennessee has in its possession other remains recently found in Hawkins County of this State. These consist of part of a tusk, measuring twenty-two inches in circumference by twelve inches in length, and a molar tooth with only two ridges. The tooth is well preserved; but the tusk is much decayed.

S. W. MCCALLIE.

University of Tennessee, Knoxville, Tenn.

The Humming-Bird's Food.

THE notes that have recently appeared in *Science* regarding the humming-bird's food, would seem to show that the bird's taste varies with the locality. In southern New York their favorite flower is the swamp-thistle (*Cirsium muticum*). No better place could be selected for studying the feeding-habits of the ruby-throats than a spot where these flowers abound. Dr. Gibbs thinks the individual flowers of the red clover too small for the ruby-throat's attention, but in the thistles the flowers are even smaller. Since it has been said that the bee gets pollen but not honey from the thistle, it would appear that the birds visit these flowers for insects. There is scarcely a flower that contains so many minute insects as a thistle-head. Examine one with a lens and it will be found to contain many insects that can hardly be seen with the unaided eye. If the ruby-throat eats insects at all, these are the ones it would take; and because the larger ones remained the observer might conclude that none were eaten.

WILLARD N. CLUTE.

Birghampton, New York, Nov. 21.

AMONG THE PUBLISHERS.

"GENERAL TAYLOR," a biography by Major-General O. O. Howard, U. S. A., will follow Mahan's "Farragut" in the Great Commander Series published by D. Appleton & Co. General Howard has visited the scenes of Taylor's campaigns in Mexico, and his book will be found to be an authority for those who are interested in the military history of our country. This biography contains a portrait and several maps.

—Macmillan & Co. announce the publication of a new work on the heavens and their origin, under the title of "The Visible Universe," by J. Ellard Gore, F.R.A.S., the author of "Star Groups," etc. The book is a discussion of the theories which have been advanced from time to time as to the construction of the heavens, celestial chemistry, stellar distances and motions, etc., and is illustrated by stellar photographs and lithographic plates.

—The January *St. Nicholas* will contain the opening paper in a series that magazine is to print on leading American cities, illustrated. In this article Colonel T. W. Higginson describes Boston in a way to interest boys and girls in the literary history of that city. For future numbers of *St. Nicholas*, Dr. Lyman Abbott will write of Brooklyn, Edmund Clarence Stedman will describe New York, and other famous residents of the different cities will describe them.

—"Electric Light Cables and the Distribution of Electricity," by Stuart A. Russell, is the latest volume in the Specialists' Series (London, Whittaker & Co.; New York, Macmillan). The recent extension of electric lighting from large central stations has brought to the front many problems connected with the economical distribution of electricity over large areas; and to the discussion and elucidation of these problems this volume is devoted. In its 319 pages the author presents a clear, reasonably comprehensive, and fully illustrated description of the various systems of distribution and types of conductor now in use, and suggests the directions in which future improvements will be made. Price, \$2.25.

—The Appalachian Mountain Club has just published a second work, with the title, "The Land of the Cliff-Dwellers," from the pen of Mr. Frederick H. Chapin. The region to which the reader

is introduced is south-western Colorado, and, in particular, the curious cañons of the Mesa Verde, which have been only recently explored and found unusually rich in abandoned homes of the cliff-dwellers; one is also made acquainted with the beautiful mountain scenery of the San Juan country, through which the cañon district of the Rio Mancos is approached from the north. The introductory chapters present in brief the history of the settlement of the south-west from the earliest Spanish explorations to the recent Anglo-American occupation. Then follows the personal narrative of the author's visits to the region, with a detailed account of his researches. Mountain-climbers will find the story of the ascents of Mount Snaefell and Uncompahgre Peak of special interest. The work is profusely illustrated. The 180 pages of text are interspersed with some 60 full-page illustrations, heliotypes, and "half-tones." "The Land of the Cliff-Dwellers" can be procured of the sales-agents of the Club, Messrs. W. B. Clarke & Co., 340 Washington Street, Boston.

— "American Mental Arithmetic" is the title of one of the American Book Company's latest school-books, by A. M. Bailey, professor of Mathematics in the Kansas State Normal School at Emporia, Kan. The designation "American" is doubtless given to the volume from purely patriotic motives, as there is no apparent reason why it would not be a good book to use in any school where the English language prevails. Price, 35 cents.

— Charles L. Webster & Co. announce that they have arranged with Henry George for the publication of his new work, "A Perplexed Philosopher," being an examination of Mr. Herbert Spencer's various utterances on the land question, with incidental reference to his synthetic philosophy. They have also arranged with Mr. George for the control of his former books and will issue them in a uniform edition. In "A Perplexed Philosopher" the main argument is an examination of Mr. Spencer's position on the land question. In 1850 Mr. Spencer issued his first book, "Social Statics," in which he denied the justice of the present treatment

of land. Later he seemed anxious to minimize and explain away these utterances, and finally he formally withdrew them. In his last book, "Justice," the recants and opposes them. Mr. George brings together and analyzes these various utterances. He also directly attacks the Spencerian idea of evolution, — that is to say, the idea of evolution that eliminates the spiritual element and assumes that the hypothesis of an intelligent Creator is unnecessary. Mr. George argues in favor of the spiritual element in evolution, and the necessity of an intelligent Creator.

— "Induction Coils" is the title of a practical manual for amateur electricians, written by G. E. Bonney (author of "The Electro-Platers' Handbook") and published by Macmillan & Co. The volume is a 12mo of 228 pages, with upwards of a hundred illustrations, and gives a general insight into the construction of ordinary spark coils, medical coils, and batteries for working them. The various chapters treat respectively of inductive theories and experiments, the construction of intensity coils, accessories to coils, special forms of induction coils, some famous coils, batteries, repairs, and useful notes on coils. To these are added a table of copper-wire properties and a list of conductors and insulators. Price, \$1.

— Charles Scribner's Sons announce "Etruscan-Roman Remains in Popular Tradition," by Charles Godfrey Leland. It is only within a few years that Mr. Leland discovered what is now for the first time published in this book, that there exists among the peasantry of secluded mountain districts in Italy, as well as among the numerous fortune-tellers or "witches" of the cities, a vast amount of ancient Etruscan or Roman traditions of extremely varied and interesting character. That no scholars had ever surmised the existence of this lore is due to the fact that it is now in a great measure kept secret, as being strictly forbidden by the priests, and connected with fortune-telling, which is punished by the law. It consists of a worship or invocation of the ancient deities, in which the names and attributes of nearly all

CALENDAR OF SOCIETIES.

Anthropological Society, Washington.

Nov. 29.—Arthur MacDonald, Genius and Insanity as forms of Abnormality; W. H. Holmes, Ancient Quarrymen of South Mountain; H. C. Mercer, Ancient Jasper Quarries in Pennsylvania.

Dec. 6.—Robert Fletcher, The Poet — is He Born, Not Made? James Mooney, Report of Special Committee on Aboriginal Geographic Names in the Potomac Region; followed by Continuation of Symposium upon same subject, by B. A. Colonna, John W. Douglass, O. T. Mason, and others.

Biological Society, Washington.

Dec. 3.—B. W. Evermann, The Cruise of the U. S. Fish Commission Steamer Albatross in Alaskan Waters in 1892; Geo. Vasey, Some New Grasses; J. N. Rose, On the Rediscovery of Certain Rare Plants; C. Hart Merriam, Exhibition of a Complete Series of the Large American Ground Squirrels of the Subgenus *Otospermophilus*; B. E. Fernow, The Mathematics of Forest Growth.

Society of Natural History, Boston.

Dec. 7.—Leon S. Griswold, Some Indian Quarries in Arkansas; Roland Thaxter, Notes on a New Order of Schizomycetes (Bacteria).

Appalachian Mountain Club, Boston.

Dec. 6.—A paper describing a trip through the White Mountains, and illustrated with

the lantern, was presented by a member of the club.

Dec. 14.—G. Frederick Wright, The Discovery and Significance of the Glacial Outlet from Lake Huron to the Ottawa River.

Society for the Advancement of Science, Las Cruces, N.M.

Dec. 1.—C. H. Tyler Townsend, Notes on the Occurrence of the Puma (*Felis concolor* L.) in Southern New Mexico; Hiram Hadley, Alkali Soils; E. O. Wootton, Notes on the Ferns of the Organs.

Publications Received at Editor's Office.

CHILDHOOD: A Monthly Magazine of all that Concerns the Welfare of the Child. Vol. I., No. I. New York. 40 p. 4°. \$1 per year.

EDWARDS, W. S. Coals and Cokes in West Virginia. Cincinnati, Robert Clarke & Co. 162 p. 8°.

HART, A. B. Formation of the Union. Epochs of American History Series. New York and London, Longmans. 278 p., maps. 12°. \$1.25.

HERTWIG, OSCAR. Text-book of the Embryology of Man and Mammals. Tr. from third German edition by E. L. Mark. New York, Macmillan. 670 p. 8°. \$5.25.

JUKES-BROWNE, A. J. The Student's Handbook of Physical Geology. 2d ed. New York, Macmillan. 666 p. 12°. \$2.25.

STERNBERG, GEO. M. Manual of Bacteriology. New York, Wood. 886 p. 8°.

THE INQUIRITOR: A Monthly Journal of Science in Plain Language. Vol. I., No. I. Chicago. 20 p. 4°. \$1 per year.

WILLIAMS, GEO. H. Geological Map of Baltimore and Vicinity. Baltimore, Johns Hopkins Press. 1°.

Reading Matter Notices.

Ripans Tabules cure hives.

Ripans Tabules cure dyspepsia.

FOSSIL RESINS.

This book is the result of an attempt to collect the scattered notices of fossil resins, exclusive of those on amber. The work is of interest also on account of descriptions given of the insects found embedded in these long-preserved exudations from early vegetation.

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the old Etruscan gods are still very accurately preserved, with those of the minor Roman rural deities, a very great number of magic ceremonies, medical cures, and preparation of amulets, accompanied with incantations, and all, as appears by the best authority, of classical origin. Thus of the one hundred very ancient Etruscan-Roman magical remedies collected by Marcellus in the fourth century, our author has found about fifty still in use. There are also given many strange beliefs connected with the occult virtues of plants and minerals, of spirits in all natural objects, the reappearance of ancestors' souls in their descendants, of Magonia, the city in the sky, where hail is made, and last, not least, a number of legends connected with these subjects—in all of which may be traced the most striking parallels with passages in ancient Latin writers; showing how much that has long supposed to be dead and forgotten still exists in the memories of modern believers in witchcraft. The same firm also announces a popular edition of the "Cyclopædia of Painters and Paintings," edited by John Denison Champlin, Jr., and Charles C. Perkins.

—The second edition of "The Horticulturist's Rule-Book," by L. H. Bailey, has just been issued by the Rural Publishing Company (Times Building, New York). It has been thoroughly revised, and brought down to the beginning of the year 1892. The volume is a useful and convenient compendium of information for fruit-growers, "truck" gardeners, florists, and others interested in horticulture. The opening chapters are devoted to insecticides, injurious insects, fungicides, plant diseases, and animal pests. These are followed by chapters on weeds and moss, grafting, seed-tables, planting-tables, maturities, yields, and multiplication, etc.

—From Frederick Warne & Co., London and New York, we have received "Electricity up to Date, for Light, Power, and Traction," by John B. Verity, M. Inst., E.E. It is a small volume of 178 pages, bound in vellum, and contains a folding map showing the areas allotted to various electric-supply companies

in London. The book is intended for the general public, not for the electrician, and consequently Mr. Verity has treated the subject in as popular a manner as its nature will admit. (Price 75 cents.)

—"A Review of the Systems of Ethics founded on the Theories of Evolution," by C. M. Williams, soon to be issued by Macmillan & Co., is one of the more important books of the year. The work is a substantial volume of over 500 pages, divided into two parts of nearly equal length, of which the first is historical, giving in detail the position of each of the prominent writers on Evolutionary Ethics; while the second or constructive portion presents the combined results of such independent investigations in chapters dealing with the concepts of evolution; intelligence and "end;" thought, feeling, and will; egoism and altruism; conscience and the moral progress of the race; the ideal and the way of its attainment.

—The progress which has characterized American mining and metallurgy during the past quarter of a century and which has made them standards and models for the whole world has been due, in no small degree, to the *Engineering and Mining Journal*. This paper has not only made those engaged in these industries familiar with the best practice in every part of the world, but it has itself created a practical technical literature of inestimable value to those engaged in mining, metallurgy, and general engineering. The collection and publication in the *Engineering and Mining Journal* of reliable statistics of the mineral industry of the United States, within a few days of the close of each year, is an achievement which has elicited the admiration of statisticians and business men in every part of the world. This work has become so important that this year its publication will require a large separate volume, which will be issued in January, 1893. The constant improvement and greatly increased cost of the *Engineering and Mining Journal* necessitate and justify the increase of its subscription to \$5.

Dyspepsia

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